SUB-SLAB DEPRESSURIZATION SYSTEM DESIGN REPORT

155 CHANDLER STREET
BUFFALO, NEW YORK

October 2017

Prepared for:

Signature Development of WNY LLC
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1.0 INTRODUCTION

On behalf of R & M Leasing LLC, Schenne & Associates has prepared this Sub-Slab Depressurization System (SSDS) Design Report relative to the Property located at 155 Chandler Street, Buffalo, New York (the Property).

The structure of this SSDS Design Report has been prepared in general conformance with requirements set forth in the New York State Department of Environmental Conservation (NYSDEC) DER-10, *Technical Guidance for Site Investigation and Remediation, May 2010* (DER-10) and the New York State Department of Health (NYSDOH) Final, *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, October 2006 (updated May 2017).

1.1 Design Objectives and Goals

The purpose of this SSDS As-Built Report is to document that the SSDS design objectives and performance goals are achievable following complete system installation. The system objectives and performance goals include the following elements:

- Reduce and maintain indoor air concentrations of below levels of the NYSDOH Soil Vapor Guidance Document Matrix A.
- Create a minimum negative pressure of at least -0.004 inches of water column (In. W.C) beneath the existing 155 Chandler Street building slab so as to prevent vapors from entering the indoor air of the building, while also releasing the trapped vapors beneath the slab;
- Demonstrate an applied zone of influence between vacuum trenches associated with the four proposed individual SSDS fans.
- Demonstrate system effectiveness while maintaining for continuous operation of the SSDS, with no significant non-operating time.

1.2 Property Overview

The Property consists of a 2-acre parcel in an industrial setting, with residential development to the south of the Property. R & M Leasing currently owns the building at the property and utilizes the space for residential, industrial and commercial uses. The 155 Chandler building occupies approximately 80,000 square feet and is surrounded by paved access roads and parking areas.

1.3 Property History

The Linde Air Products Factory was built in phases from 1907 to 1959, with a majority of the building constructed by the Linde Air Products Company between 1907 and 1948. The building is a C-shaped plan that is nearly fully enclosed, forming a center courtyard. The footprint of the red brick factory is approximately 300 feet wide by 275 feet deep in size. The earliest portions of the building are two-story solid masonry construction with double-hung wood windows, brick piers, and pitched roofs along the northern half of the existing building. Though portions of the northern half of the building are two stories in height while the southern and eastern sections are only a single story, the massing of much of the building means the one-story sections are often as tall or taller than the two-story sections.

As the Linde Air Products Company, America's largest liquid oxygen manufacturing company, grew, it both built new facilities and expanded the Chandler Street factory to the south, east, and west. Its periods of growth coincide with the company's takeover by the Union Carbide Company and the changing focus of the factory from oxygen production to machinery repair and research development. During World War II, the plant remained in the hands of the Linde Air Products Company until 1948. In 1951, Bell Aircraft occupied the building, constructing several one-story cinder-block additions in 1952 that projected into the courtyard, as well as introducing cinderblock partitions throughout several of the wings. It latter years the building was occupied by a number of industrial companies.

R & M Leasing purchased the property in 2017 and implemented a number of cleanup measures at the Property including:

- Asbestos abatement of the buildings and grounds
- Excavation of 5,500 tons of contaminated soil and concrete at the Property; and
- A proposed sub slab depressurization system to reduce or eliminate vapor intrusion .

2.0 BASELINE INDOOR AIR QUALITY ASSESSMENT

In order to develop a baseline understanding of indoor air and sub-slab vapor concentrations Hazard Evaluations Inc., (HEI), prepared an indoor air and sub-slab vapor sampling plan that included the collection of samples to establish a baseline for indoor air and sub-slab vapor. A total of six indoor air and five sub-slab vapor samples were collected concurrently and were designated as IA-1 through IA-6 and SS-1 through SS-6, respectively. Sample SS-5 was destroyed due to construction activities.

The baseline indoor air and sub-slab vapor sampling was conducted in September 2017. The volatile organic compounds (VOCs) of focus included Trichloroethylene, (TCE), Tetrachloroethene and, Methylene chloride, however a full USEPA TO-15 scan was conducted.

The findings of the 2017 Baseline Assessment are summarized as follows.

Indoor Air Quality

- Methylene chloride was identified in a single indoor air sample at concentrations above NYSDOH Soil Vapor/Indoor Air Matrix A and/or Matrix B mitigation guidance levels. The concentrations of Methylene chloride was 150 ug/m^3 in sample IA-4. The source in likely not sub slab but rather related to construction activities.

Sub-Slab Vapor

- TCE was identified in three of the six sub-slab vapor samples at concentrations that ranged from 2.2 ug/m^3 in sample SS-2 to 3,500 ug/m^{3}in sample SS-4.

- Tetrachloroethene was identified in one of the six sub-slab vapor samples at a concentration in sample SS-4 of 340 ug/m^3.

3.0 SSDS DESIGN

Analytical testing for VOCs indicated an area of concern with the Southeast portion of the building, (See Table 5, HEI/SA draft Report). Based on Indoor Samples the migration is minimal if at all. The overall objective of this SSDS is to limit the potential migration of sub-slab soil vapor into the indoor air of the 155 Chandler Street building through meeting the system performance objectives described in Section 1.1.

The SSDS layout as proposed is depicted on Figure 1 – SSDS Installation Layout Plan. See project details on SK-1.

3.1 SSDS Controls, Monitoring and Piping Network

The four (4) OBAR fans are proposed to be individually monitored in real time by a Sensaphone SCADA 3000 Remote Terminal Unit (RTU). The SCADA 3000 will monitor the SSDS 24 hours per day through receivers mounted on the building that receive continuous wireless signals from the transmitters mounted on each fan. Each fan will also include an interior mounted monometer installed at eye level to provide a visual indication to tenants that the system is operating. In the event that a fan loses power or vacuum an alarm will be initiated by the SCADA 3000 that notifies the administrator through a telephone call.

The piping network will consist of 3-inch diameter schedule 40 polyvinyl chloride (PVC) piping originating at four vacuum trench floor locations and connecting to 4”-inch diameter risers. The proposed vacuum trench locations are depicted on Figure 1. The trench locations were located near building column lines with the intent for the interior columns to provide a level of protection for the vertical PVC risers.

The horizontal pipes runs are to be installed with a minimum slope returning to the vacuum trenches of 1-inch per 20-feet. All 4 vacuum trenches will include 2-inch ball valves for balancing the system, where required. Trenches would be backfilled with washed #2 stone and covered with a new 4” concrete floor. Each vacuum trench will be sealed with foam backer rod and polyurethane self-leveling caulk and allowed to sufficiently dry according to manufacturer specifications prior to activation of the system.

The horizontal pipe under the roof are to be where necessary supported with pipe hangers within two feet of couplings and a maximum hanger spacing of six feet per New York State Plumbing Code. Vertical 4” PVC piping (SCH.40) will be raised to the underside of the roof and penetrate the roof diaphragm. Depending on the location it may be necessary to run horizontally an short distance to avoid structural framing a rain cap will be mounted to the pipe on the roof to allow exhaust and control ram water.

4.0 CONCLUSIONS

Based on the results of the recently completed Soil Vapor Intrusion Testing Results a SSDS installation, and post SSDS installation indoor air sampling will be required at the property.

Pre-SSDS Indoor Air Quality

NYSDOH VOCs of concern were detected in an indoor air sample at concentrations above NYSDOH Air Matrix A Guidance Values, during the Pre-SSDS sampling event.

On going construction activities may have been the source of the methylene chloride.

Sub-Slab Soil Vapor

NYSDOH VOCs of concern were detected in three of the six sub-slab soil vapor samples at concentrations that are of concern.

5.0 RECOMMENDATIONS

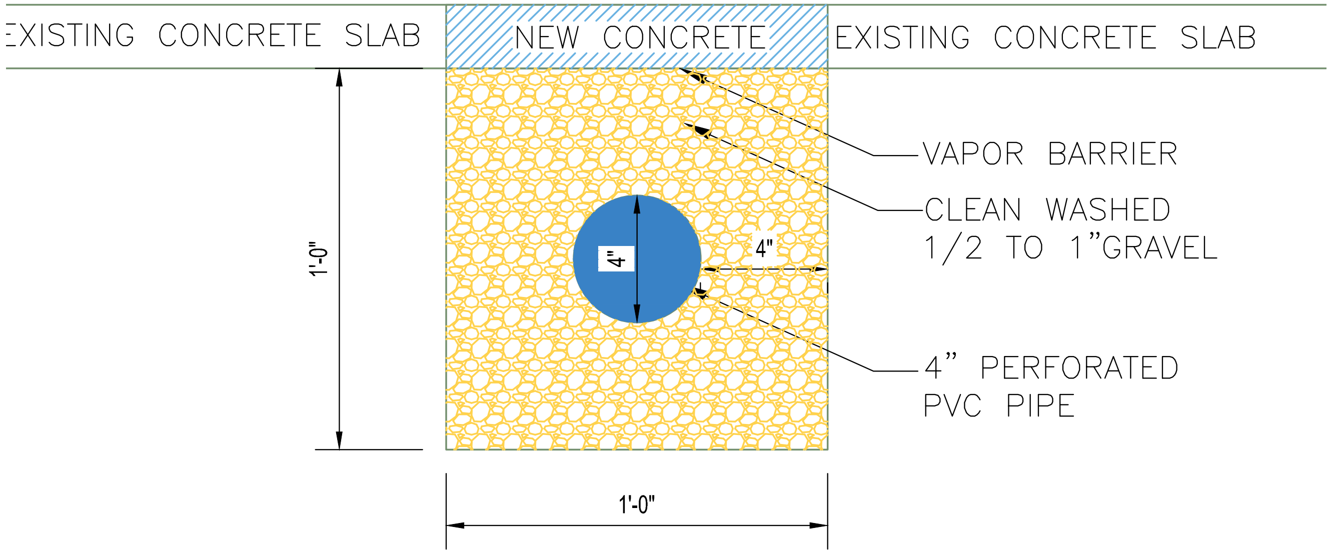
Based on the results and findings herein, it is recommended that the SSDS be installed and to operated to mitigate the potential for soil vapor intrusion and to release the trapped sub-slab soil vapor.

The effectiveness of the system should be demonstrated through a pressure field extension test following installation. The indoor air should be re-sampled during the 2017-2018 heating season to continue to the document the effectiveness of the SSDS and to report the results in the annual periodic review report (PRR) for the Property.

6.0 REFERENCES

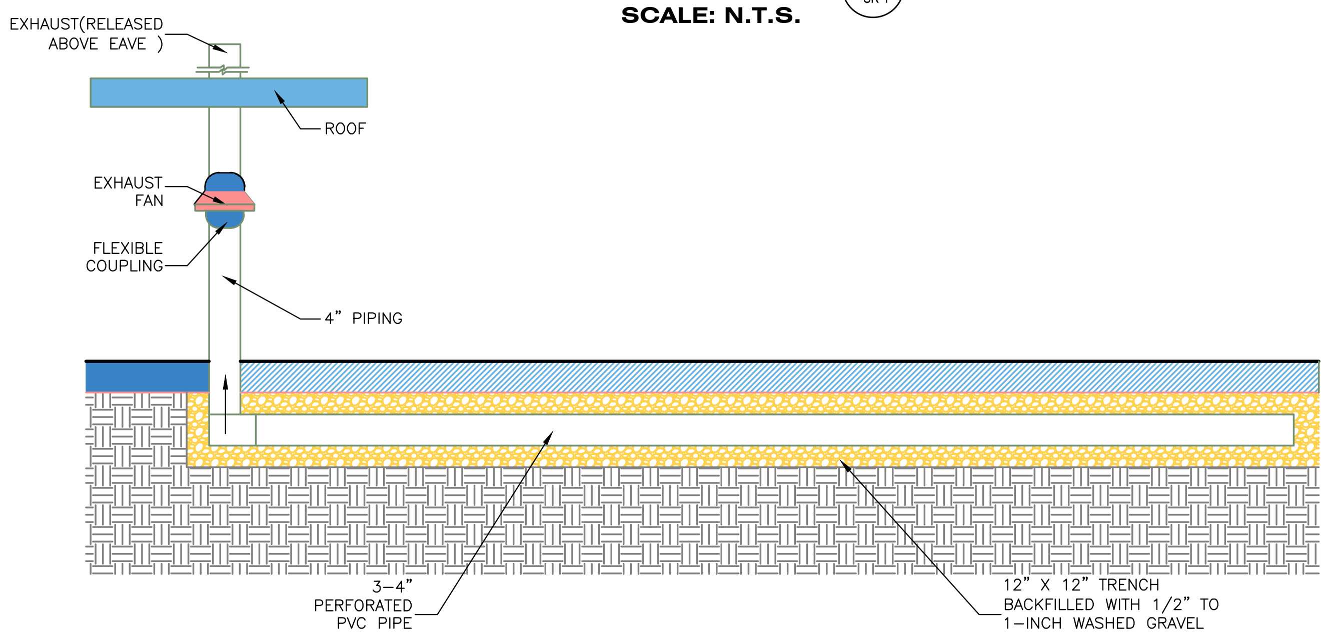
New York State Department of Health (October 2006, Updated May 2017). *Guidance for Evaluation Soil Vapor Intrusion in the State of New York.*

United States Environmental Protection Agency. *Radon Mitigation Standards (EPA 402-R-93-078, Revised April 1994)*



TYPICAL CROSS-SECTION OF SSDS TRENCH AND PIPING (1 / SK-1)

SCALE: N.T.S.



TYPICAL SSDS TRENCH PROFILE (2 / SK-1)

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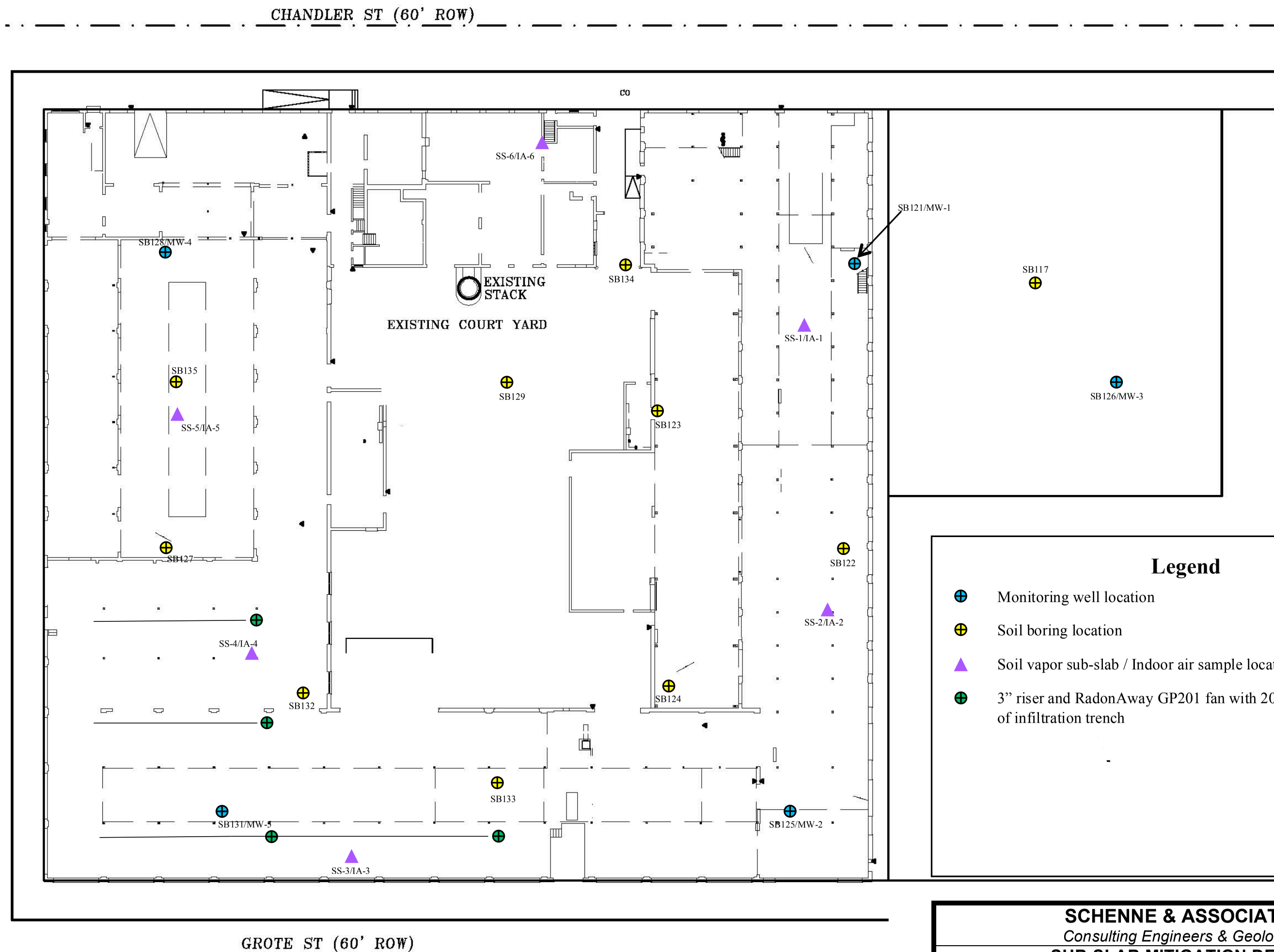
JOB:17-1725 DRAWN BY WX
SUB-SLAB MITIGATION DESIGN
DWG. SK-1
SCALE: AS NOTED
DATE: 10/16/2017



Legend

- Monitoring well location
- Soil boring location
- Soil vapor sub-slab / Indoor air sample location
- 3” riser and RadonAway GP201 fan with 20 LF. of infiltration trench

SUB-SLAB MIGRATION SYSTEM

N.T.S.

SCHENNE & ASSOCIATES *Consulting Engineers & Geologists*		
SUB-SLAB MITIGATION DESIGN 155 and 157 CHANDLER STREET BUFFALO, NEW YORK		
R & M LEASING LLC BUFFALO, NEW YORK		
DRAWN BY: SS	SCALE: 1” = 40’	PROJECT: e1601
CHECKED BY: MMW	DATE: 10/17	FIGURE NO: 1

Table 1
Soil Vapor Intrusion Analytical Testing Results
155 Chandler Street, Buffalo, NY
September 2017

Parameter	Guidance Values- Indoor Air: Table C2 Commercial Indoor Air Background (90%)	Guidance Values- Indoor Air: NYSDOH Air Guideline Value	SS-1 Sub-Slab	IA-1 Indoor Air	SS-2 Sub-Slab	IA-2 Indoor Air	SS-3 Sub-Slab	IA-3 Indoor Air	SS-4 Sub-Slab	IA-4 Indoor Air	SS-5 Sub-Slab	IA-5 Indoor Air	SS-6 Sub-Slab	IA-6 Indoor Air	OA001 Outdoor Air	Table C2 Outdoor Air Guidance Values
1,1,1-Trichloroethane	20.6		ND	ND	ND	ND	ND	ND	62	ND	Sample destroyed due to construction activity	ND	ND	ND	ND	2.6
1,2,4-Trichlorobenzene	<6.8		ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	0.98	<6.4
1,2,4-Trimethylbenzene	9.5		8.4 J	0.88	5.8 J	0.98	47	1.5	7.1	5.9		4.7	5.6 J	75	ND	5.8
1,3,5-Trimethylbenzene	3.7		1.9 J	ND	3.0 J	ND	12	0.54 J	3.2 J	1.9		1.2	1.7 J	31	ND	2.7
2,2,4-trimethylpentane	NV		ND	ND	ND	ND	ND	ND	ND	ND		3.1	ND	ND	0.98	NV
4-ethyltoluene	3.6		2.1 J	ND	3.2 J	ND	13	ND	2.9 J	1.4		1	1.9 J	34	ND	3.0
Acetone	98.9		52	28	230	33	380	49	180	150		40	390	290	30	43.7
Benzene	9.4		4.9	1.1	18	0.89	23	2.9	80	6.3		9.3	110	6.1	1.1	6.6
Bromomethane	<1.7		ND	ND	ND	ND	ND	ND	ND	ND		ND	1.2 J	ND	ND	<1.6
Carbon disulfide	4.2		0.81	ND	4.9	ND	9.0	ND	6.7	ND		ND	25	ND	ND	3.7
Carbon tetrachloride	<1.3		2.0	0.63	ND	0.69	41	0.63	23	0.57		ND	1.4 J	0.63	0.63	0.7
Chloroethane	<1.1		ND	ND	ND	ND	ND	ND	ND	ND		ND	1.1 J	ND	ND	<1.2
Chloroform	1.1		2.5	ND	0.78	ND	35	ND	28	ND		ND	3.5 J	ND	ND	0.6
Chloromethane	3.7		ND	1.3	0.33	1.3	ND	1.4	ND	1.8		1.3	5.9	1.9	1.7	3.7
cis-1,2-Dichloroethene	<1.9		ND	ND	ND	ND	ND	ND	3.3 J	ND		ND	ND	ND	ND	<1.8
Cyclohexane	NV		5.9	ND	39	ND	48	0.52	210	1.4		1.9	610	1.9	0.55	NV
Ethylbenzene	5.7		5.0 J	1.3	7.7 J	2.8	34	2	9.8	2.8		2.3	8.9 J	2.3	1.3	3.5
Freon 11	NV		1.2	1.8	1.6	1.6	1.7	1.5	2.0 J	1.6		1.5	1.5 J	1.5	1.6	NV
Freon 113	NV		ND	ND	ND	ND	ND	ND	0.84 J	ND		ND	ND	ND	ND	NV
Freon 12	NV		2.5	3	2.7	2.9	2.7	2.7	3.0 J	2.6		2.7	2.5 J	2.6	2.7	NV
Heptane	NV		6.8	1.2	78	ND	75	1	410	2.9		3.7	690	3.9	0.98	NV
Hexane	NV		17	2.9	79	14	60	36	560	31		7.4	680	220	6.8	6.4
Isopropyl alcohol	NV		3.9	7.4	4.1	2.2	19	1.1	ND	13		1.9	ND	17	4.9	NV
m&p-Xylene	22.2		18.0 J	4.9	17	3.6	140	7.5	27	12		9.6	27	11	4.7	12.8
Methyl Ethyl Ketone	12		3	2.2	11	4.7	51	23	8.5	47		2.4	18	2	2.2	11.3
Methyl Isobutyl Ketone	NV		ND	0.53 J	ND	0.57 J	ND	ND	ND	ND		ND	ND	ND	ND	NV
Methylene chloride	10	60	2	3	2.9	2.2	2.4	1.6	2.6 J	150		2.5	2.4 J	3.9	1.8	6.1
o-Xylene	7.9		7.1 J	2	6.3	3.6	48	3	8.6	3.9		3.3	9.1 J	6.1	2	4.6
Styrene	1.9		0.51 J	ND	ND	ND	0.47 J	ND	0.77 J	0.81		0.89	ND	0.77	ND	1.3
Tetrachloroethylene	15.9	30	1.3 J	0.75	0.95 J	1	9.7 J	1.2	340	0.95		0.68	ND	0.81	ND	6.5
Tetrahydrofuran	NV		0.53	1.3	0.94	4.7	3.7	40	0.8 J	91		0.85	ND	0.71	1.1	NV
Toluene	43		35	6.2	31	6.3	170	12	110	15		22	110	31	3.9	33.7
trans-1,2-Dichloroethene	NV		ND	ND	ND	ND	ND	ND	2.6 J	ND		ND	ND	ND	ND	NV
Trichloroethene	4.2	2	ND	ND	2.2 J	0.38	730	0.27	3,500	1.7		ND	ND	0.64	ND	1.3
Vinyl chloride	<1.9		ND	ND	ND	ND	ND	ND	ND	ND		ND	0.66 J	ND	ND	<1.8

Notes:

1. Compounds detected in one or more samples included in this table. For a list of all compounds, refer to analytical report in Attachment C.
2. Analytical testing for VOCs via TO-15 completed by Centek Laboratories in Syracuse, New York.
3. Results present in ug/m^3 or microgram per cubic meter.
4. Samples were collected during a 24-hour sample duration.
5. 90th percentile values as presented in C2 (EPA 2001: Building assessment and survey evaluation (BASE) database) Appendix C, in the NYSDOH Guidance Manual, as indicated for Indoor and Outdoor air only.
6. Air Guidance Values from "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" dated October 2006, prepared by New York State Department of Health.
7. NYSDOH does not currently have standards, criteria or guidance values for concentrations in sub-slab vapor. The detection of VOCs in sub-slab vapor samples does not necessarily indicate soil vapor intrusion is occurring or action should be taken to address exposures.
8. Grey shaded values represent exceedance of table C2 guidance values; yellow shaded values represent exceedance of NYSDOH Air Guidance Values
9. Qualifiers: J = result is less than the reporting limit but greater or equal to the method detection limit and the concentration is an approximate value.
10. ND = Non Detect; NV = No Value

Table 2
Soil Vapor Intrusion Decision Matrices
155 Chandler Street, Buffalo, NY

Sample ID	Parameter	Sub-slab Vapor Concentrations (ug/m^3)	Indoor Air Concentration (ug/m^3)	Recommended Action
Matrix A Trichloroethene (TCE); cis-1,2-dichloroethene (cis-DCE); 1,1-dichloroethene (1,1-DCE); Carbon Tetrachloride				
SS-1/IA-1	TCE	ND	ND	No further action
	cis-DCE	ND	ND	No further action
	1,1-DCE	ND	ND	No further action
	Carbon Tetrachloride	2	0.63	No further action
SS-2/IA-2	TCE	2.2 J	0.38	No further action
	cis-DCE	ND	ND	No further action
	1,1-DCE	ND	ND	No further action
	Carbon Tetrachloride	ND	0.69	No further action
SS-3/IA-3	TCE	730	0.27	Mitigate
	cis-DCE	ND	ND	No further action
	1,1-DCE	ND	ND	No further action
	Carbon Tetrachloride	41	0.63	Monitor
SS-4/IA-4	TCE	3500	1.7	Mitigate
	cis-DCE	3.3 J	ND	No further action
	1,1-DCE	ND	ND	No further action
	Carbon Tetrachloride	23	0.57	Monitor
SS-5/IA-5	TCE	Sample destroyed	ND	No further action
	cis-DCE		ND	No further action
	1,1-DCE		ND	No further action
	Carbon Tetrachloride		ND	No further action
SS-6/IA-6	TCE	ND	0.64	No further action
	cis-DCE	ND	ND	No further action
	1,1-DCE	ND	ND	No further action
	Carbon Tetrachloride	1.4 J	0.63	No further action
Matrix B Methylene Chloride (MC); 1,1,1- Trichloroethane (1,1,1-TCA); Tetrachloroethylene (PCE)				
SS-1/IA-1	MC	2	3	No further action
	1,1,1-TCA	ND	ND	No further action
	PCE	1.3	0.75	No further action
SS-2/IA-2	MC	2.9	2.2	No further action
	1,1,1-TCA	ND	ND	No further action
	PCE	0.95	1.0	No further action
SS-3/IA-3	MC	2.4	1.6	No further action
	1,1,1-TCA	ND	ND	No further action
	PCE	9.7	1.2	No further action
SS-4/IA-4	MC	2.6 J	150	Identify source(s) and Resample or Mitigate
	1,1,1-TCA	62	ND	No further action
	PCE	340	0.95	No further action
SS-5/IA-5	MC	Sample destroyed	2.5	No further action
	1,1,1-TCA		ND	No further action
	PCE		0.68	No further action
SS-6/IA-6	MC	2.4 J	3.9	No further action
	1,1,1-TCA	ND	ND	No further action
	PCE	ND	0.81	No further action
Matrix C Vinyl Chloride (VC)				
SS-1/IA-1	VC	ND	ND	No further action
SS-2/IA-2	VC	ND	ND	No further action
SS-3/IA-3	VC	ND	ND	No further action
SS-4/IA-4	VC	ND	ND	No further action
SS-5/IA-5	VC	Sample destroyed	ND	No further action
SS-6/IA-6	VC	0.66J	ND	No further action